

Exhibit A

REPLICATION AGREEMENT

This Replication Agreement (this "Agreement") is dated as of January 1, 2005 by and between MGM Home Entertainment LLC ("MGM") and Sonopress GmbH, it being understood that Sonopress is also authorized to act on behalf of the worldwide group of Sonopress-entities operating under the "Sonopress"-trade name with manufacturing and replication facilities in, *inter alia*, the United States, Ireland, Mexico, Hong Kong and Singapore (Sonopress GmbH, together with its Affiliates (as such term is defined hereinafter) shall collectively be referred to as "Sonopress")

Whereas MGM requires DVD replication services, and whereas Sonopress provides the required services, both parties agree to enter into this Agreement to stipulate the terms and conditions mutually agreed upon.

1. Definitions:

Affiliates: Shall mean, as to Sonopress, an entity that is a "*verbundenes Unternehmen*" (as such term is defined in §§ 15 ff. AktG – German Act on Stock Corporations) of Bertelsmann AG in any jurisdiction.

Approved Offload Facility: Shall mean the replication facility of any of the following companies: Sony DADC, Technicolor, Cinram, and any other company performing replication services that may be approved by MGM in writing as an Approved Offload Facility.

Contract Year: Shall mean each consecutive twelve-month period during the Term, with the first Contract Year commencing on January 1, 2005.

\$: Shall refer to the United States Dollar.

DVD: Shall mean a prerecorded optical disc which conforms to the then current DVD Specifications, including, without limitation, a DVD-5, DVD-9, DVD-10, DVD-14 and DVD-18. MGM acknowledges and agrees that DVD-14s and DVD-18s will be manufactured by Sonopress only at its facility in Weaverville, North Carolina, USA and the pricing relating thereto will be in \$ as stated in Exhibit A.

DVD Specifications: Shall mean for Read Only Discs - Part 1 - Physical Description, Part 2 - Image File and Part 3 - Video Specifications published and copyrighted in 1996 by Hitachi, Ltd., Matsushita Electric Industrial Co., Ltd., Mitsubishi Electric Corporation, Philips Electronics N.V., Pioneer Electronic Corporation, Sony Corporation, THOMSON multimedia, Time Warner Inc., Toshiba Corporation and Victor Company of Japan, Limited.

€: Shall refer to the Euro currency used in certain countries of the European Union.

Guaranteed Quantity: Shall mean One Hundred Twenty Million (120,000,000) Units replicated by Sonopress pursuant to the terms of this Agreement. The parties acknowledge and agree that the Guaranteed Quantity supersedes and replaces any other replication commitment between MGM and Sonopress prior to the date of this Agreement.

Purchase Order: Shall mean a written or electronic purchase order from MGM (or its distributor) for replication containing a purchase order number, order type, a quantity ordered, a requested delivery date, a catalogue number, a final bill of material, with all of the components specified on that bill of material necessary to complete the manufacture of the ordered product.

Shortfall Amount: Shall mean the amount equal to (a) € 0.09, multiplied by (b) the Guaranteed Quantity minus the total number of Units replicated by Sonopress under the Agreement as of December 31, 2009.

Territory: Shall mean worldwide.

Unit: Shall mean a single DVD disc. For example if a title is comprised of two DVD discs, then the title shall be considered to be two Units.

Workable Order: Shall mean a Purchase Order shall be considered workable the next business day (in the respective country of manufacture) after Sonopress has received all components (supplied by MGM or its distributor) necessary to complete the manufacture of that order. Components include masters, bill of materials, art work, inserts, stickers, sleeves, merchandiser parts, and all necessary approvals from MGM (or its distributor), etc.

2. Term:

The term of this Agreement (the "Term") shall commence January 1, 2005 and shall expire on the earlier of December 31, 2009 and the date on which the Guaranteed Quantity has been replicated under the Agreement; provided, however, that if the Guaranteed Quantity has not been replicated by December 31, 2009, MGM shall have the option either (a) to pay the Shortfall Amount to Sonopress, or (b) to extend the Term to the earlier of December 31, 2010 and the date the Guaranteed Quantity shall have been replicated by Sonopress (provided, that in the event the Guaranteed Quantity shall not have been replicated by Sonopress as of December 31, 2010, MGM shall pay to Sonopress an amount equal to (i) € 0.09, multiplied by (ii) the Guaranteed Quantity minus the total number of Units replicated by Sonopress under the Agreement as of December 31, 2010). MGM shall inform Sonopress as to how it intends to exercise its option no later than October 31, 2009. In the event MGM intends to pay the Shortfall Amount, the parties shall determine the Shortfall Amount as of December 31, 2009.

3. INTENTIONALLY OMITTED.

4. Services:

(a) Sonopress agrees to render to MGM, for the Territory during the Term, on a nonexclusive basis, DVD replication and associated services (the "Services") as described and at the prices set forth in the attached Exhibit A. All Services hereunder will be rendered at Sonopress's own facilities or at an Approved Offload Facility; provided that Sonopress shall notify MGM in advance of any offloading of Services at an Approved Offload Facility. Sonopress shall not offload Services to any other facility unless MGM approves otherwise in each instance, which approval shall not be unreasonably withheld or delayed in the event the manufacturing facility to which Sonopress wishes to offload Services is of a similar standing and reputation and providing similar quality levels as Sonopress.

(b) Sonopress acknowledges and agrees that MGM's distributor (currently Sony Pictures Home Entertainment) will undertake and perform many of MGM's day-to-day functions and responsibilities under this Agreement on behalf of MGM, including, without limitation, placing Purchase Orders with Sonopress, and Sonopress shall cooperate and work with representatives of Sony Pictures Home Entertainment (and any other distributor of MGM product in the future) who are acting on behalf of MGM under this Agreement. MGM shall remain fully liable for any acts or omissions undertaken by Sony Pictures Home Entertainment (or any other distributor, its employees, officers, directors, and the like assigned by MGM) in fulfillment of the Agreement.

(c) To ensure that Sonopress has sufficient capacity to meet MGM's requirement for Services and to facilitate procurement/manufacture of raw materials and scheduling of production, both parties agree to discuss, in advance, anticipated production requirements for the upcoming twelve (12) months. On a semi-annual basis Sonopress shall provide MGM with its available capacity to perform the Services for the upcoming 12-month period, and MGM shall provide Sonopress with its rolling twelve (12) month forecast of the anticipated Units to be replicated (the "Forecasted Volume"). Sonopress acknowledges and agrees that the Forecasted Volume and related information are provided by MGM to Sonopress on a confidential basis and that Sonopress shall not disclose any such information to any third party. Sonopress agrees to cooperate with MGM and use its best efforts in meeting MGM's requirements for Services, including any rush orders. MGM acknowledges and agrees that Sonopress shall have no obligation to incur any additional capital expenditure in meeting MGM's requirement for Services.

(d) Sonopress shall provide MGM with dedicated account representation which is readily available via mobile e-mail access and cellular telephone as well as dedicated resources for the performance of the Services for the duration of the Term.

5. Pricing:

(a) Sonopress shall charge MGM, and MGM shall pay Sonopress, for the Services at the prices set forth in Exhibit A. The prices for the Services include any and all patent and other royalties in connection with the manufacturing of DVD Units, and MGM shall have no additional obligation whatsoever to pay any such royalties to any party. Subject to the exceptions set forth in Paragraphs 5(b) and 5(c) below, Sonopress and MGM hereby agree that pricing for the Services shall be fixed for the Guaranteed Quantity.

(b) In the event the market index for polycarbonates changes by plus or minus 20%, the replication price per Unit shall be correspondingly adjusted upwards or downwards by € 0.01 for each of such 20% change, such adjustment not to be made more frequently than once a Contract Year. The starting benchmark shall be the market index for polycarbonates as of January 1, 2005 as set forth in Exhibit A.

(c) Beginning on January 1, 2007, not more than once each Contract Year, MGM may obtain a *bona fide* bid on arms-length terms and conditions from one or more of Technicolor, Cinram, and any other provider(s) of Services (other than Sony DADC or any entity with which MGM is, or at the time of soliciting the bid will be, affiliated) that (i) is of comparable size, quality, reputation and financial soundness as Sonopress, (ii) already has an established capacity and quality standards to service MGM's requirements for all of the Services in the Territory, and (iii) is approved by Sonopress in its sole discretion. This bid shall be for all of the Services to be provided by Sonopress hereunder for the remaining portion of the Guaranteed Quantity (i.e. Units regarding which Purchase Orders have not been placed with Sonopress by MGM at the time of the bid) and for the then-remaining Term hereunder. If the average of all such bids obtained by MGM offers a price reduction of not more than € 0.09 per Unit, Sonopress shall continue to provide the Services hereunder at the then-current prices. If the average of all such bids obtained by MGM offers a price reduction of more than € 0.09 per Unit (the price reduction per Unit in excess of € 0.09, the "Competitive Discount"), MGM shall present the result of the bids to Sonopress together with a certification from a senior executive of MGM that each of the bids is genuine, satisfies all the requirements set forth above in this paragraph, and represents the complete and entire offer by such provider of Services, and Sonopress shall immediately reduce the price per Unit under the Agreement by the Competitive Discount on a going-forward basis (i.e. for Units regarding which Purchase Orders have not been placed with Sonopress by MGM at the time of MGM's presentation); provided, however, in no event shall the price per Unit under the Agreement be reduced to an amount below: (i) during the Contract Year beginning on January 1, 2007, € 0.36 per Unit for DVD-5 and/or € 0.38 per Unit for DVD-9, (ii) during the Contract Year beginning on January 1, 2008, € 0.33 per Unit for DVD-5 and/or € 0.35 per Unit for DVD-9, (iii) during the Contract Year beginning on January 1, 2009, € 0.31 per Unit for DVD-5 and/or € 0.33 per Unit for DVD-9, and (iv) to the extent the Agreement is extended pursuant to Paragraph 2 above, during the Contract Year beginning on January 1, 2010, € 0.30 per Unit for DVD-5 and/or € 0.32 per Unit for DVD-9; and provided, further, that any such price reduction shall not apply to the first 20 million Units being replicated at any time under the Agreement.

6. Materials/Technical Standards:

Sonopress guarantees that the Units shall be made from first class materials, and will meet or exceed Sonopress's technical specifications attached as Exhibit B. All Units shall be consistent with the quality of the masters provided by MGM, will meet the minimum audio and visual technical specifications set forth in Exhibit B and will be of a quality standard equal to or greater than that supplied by any first class manufacturing facility in the home video industry in the United States for the comparable format requested by MGM and all material used shall be standard grade and meet or exceed JVC and ITA specifications. MGM retains the right to audit Sonopress's performance under this Paragraph 6. at any time, upon reasonable prior notice and

during normal business hours, either by on-site inspections or by random sampling of finished goods.

7. Security:

(a) Sonopress will use commercially reasonable efforts to provide all security systems and procedures as are necessary to prevent theft, piracy, unauthorized exhibitions, copying or duplication of the Units. Sonopress warrants that all Sonopress facilities at which any of the Services will be provided are protected by: recognized premises alarm systems governing human entry/exit points; requirement that photo ID or other security badges be displayed by all staff, visitors and employees of any outside firm permitted entry into the premises; requirement that staff, visitors, and employees of any outside firm operate under the supervision of the plant supervisor; requirement that employees use controlled access to the premises; and that full time twenty-four (24) hour security guards are on duty who monitor exterior perimeter and surrounding acreage, as well as random plant locations.

(b) Sonopress agrees that MGM's masters and sub masters will be stored in a vault under industry approved conditions. Masters will remain vaulted when not required for production runs. Masters will not be erased, degaussed or shipped from the premises unless specifically requested or approved in writing by MGM. Sonopress shall use best efforts when rendering Services to protect against and avoid damages or injury to MGM's masters.

8. Orders:

The parties agree that official commencement of production runs will commence on receipt by Sonopress of authorized MGM Workable Orders, and that such authorizations shall be given by Purchase Orders. Purchase Orders will be conveyed by MGM or its distributor by fax, e-mail, mail or EDI or any other mode of electronic communication and confirmed as received by Sonopress.

9. Turnaround:

The parties agree on the time frames listed in Exhibit A hereto with respect to the production of Units ordered by MGM.

10. Terms:

Sonopress will issue an invoice for Units shipped against Purchase Orders, and each invoice will quote a specific Purchase Order number. The parties agree that the payments terms shall be as described in Exhibit A hereto.

11. Insurance:

Sonopress shall at its sole cost and expense continuously maintain in force during the Term:

- (i) A policy of insurance insuring all MGM's property in Sonopress's possession, custody and control against loss, damage or destruction by fire, theft, vandalism, or malicious mischief, with such policy having minimum liability limits equal to the raw material replacement value of such property.
- (ii) A policy of Comprehensive General Liability Insurance, including product liability, insuring against claims of personal injury or property damage arising out of Sonopress's performance of its obligations hereunder, or use of the DVDs provided by Sonopress hereunder, with such policy having a minimum combined liability limit of € 1,000,000.

12. Notices:

Notices to be delivered to either party by the other may be by fax, mail, courier or overnight mail to the addresses previously stated, and sent to the attention of:

For Sonopress: Mr. Hermann Heemeyer
Sonopress GmbH
Carl-Bertelsmann-Str. 161 F
D-33311 Gütersloh
Germany
Fax: 49-52-41-73-543

With a cc to: Mr. Martin Dannhoff
Legal Counsel, Corporate Legal Department
Bertelsmann AG
Carl-Bertelsmann-Str. 270
D-33311 Gütersloh
Germany
Fax: 49-5241-80 93 24

For MGM: Mr. Craig Ruby
VP Finance, Worldwide Home Entertainment
MGM Home Entertainment LLC
2450 Broadway Street
Santa Monica, CA 90404
USA
Fax: 1-310-449-3042

With a cc to: Mr. Christopher Yin
Senior Counsel, Business & Legal Affairs
MGM Home Entertainment LLC
2450 Broadway Avenue
Santa Monica, California 90404
USA
Fax: 1-310-449-3106

Notices sent by fax are deemed to be received immediately, by courier or overnight mail, next day, and by mail within seven (7) calendar days.

13. Default:

If (i) any party is in material breach of any material terms or conditions of this Agreement ("Material Breach") or (ii) any party becomes insolvent, makes an assignment for the benefit of creditors, becomes subject to any proceeding under bankruptcy or insolvency law, or subject to the appointment of a receiver (or similar proceeding) for any of such parties assets ("Insolvency Event") the non breaching party may terminate this Agreement; provided, however, if such Material Breach is not willful and is capable of cure, the non-breaching party shall notify the other party in writing of such Material Breach and such party shall have thirty (30) calendar days to cure such Material Breach. If such Material Breach remains uncured for thirty (30) calendar days following written notice, the non-breaching party may terminate this Agreement. In the event of any Material Breach by any party, the respective other party shall be limited in an action at law for damages. Sonopress shall not, under any circumstances, be entitled to enjoin or restrain or otherwise interfere with the exploitation of the Units, or retain possession or make any claim against any material provided by MGM.

14. Intellectual Property Rights Warranty:

(a) MGM hereby represents and warrants to Sonopress that MGM has all necessary rights (including without limitation, intellectual property rights, copyrights and trade marks), licenses,

permissions, consents and authorizations so as to permit Sonopress to manufacture and otherwise render the Services in respect of the material to be replicated by Sonopress as contemplated by this Agreement. The representation and warranty of MGM contained in this Paragraph shall be deemed to be made and given continuously throughout the Term and shall be deemed to have been relied upon by Sonopress continuously throughout the Term. In addition, MGM acknowledges that Sonopress participates in the International Recording Media Association ("IRMA") Anti-Piracy Compliance Program, and MGM agrees to comply with all of the terms and provision of such IRMA Program.

(b) Sonopress hereby represents and warrants to MGM that Sonopress's use of the replication / manufacturing processes and technology required to produce the Units pursuant to this Agreement shall not infringe or violate any rights, including without limitation, intellectual property rights, of any entity.

15. **Indemnity:**

(a) Sonopress shall indemnify, defend and save harmless MGM from and against any and all costs, claims, causes of action, suits, judgments, harm, damages, liabilities, losses and expenses (including, without limitation, all reasonable legal fees and disbursements) of any and every nature and kind whatsoever (whether arising out of a judgment or otherwise) ("MGM-Claims") actually incurred, sustained or suffered by MGM or by any of its affiliates, successors, licensees and assigns and their respective officers, agents and employees ("MGM Parties") arising from, or otherwise attributable to Sonopress's breach of, alleged breach of, or non-compliance with any of the provisions of this Agreement, including, without limitation, the failure of Sonopress to possess the full right and license to use all intellectual property, including software and patented equipment, methods and processes, used in the provision of Services to MGM. Without limiting the generality of the above provision, the indemnity obligations of Sonopress shall include, without limitation, the indemnification of MGM Parties from and against all MGM-Claims which arise out of or are in connection with any infringement by Sonopress of any patent, copyright, trademark, trade secret or other proprietary rights of any third parties in the course of Sonopress's Services to MGM hereunder, except where such MGM-Claim is a result of the program content of any Unit. Sonopress will indemnify, defend and save harmless MGM Parties from any and all MGM-Claims which arise out of or are in connection with Sonopress's failure to pay any amount with respect to patent and other royalties in connection with the Units, or any portion thereof, no matter what the reason or excuse. Said amounts shall include, without limitation, such sums owed to the two DVD patent pools commonly known as the 6C and the 3C / 4C. For the avoidance of any doubt, Sonopress' obligation to indemnify the MGM Parties under this Paragraph 15 (a) shall in no way limit, impair or otherwise affect MGM's obligations under Paragraph 14 (a) or 15 (b).

(b) MGM shall indemnify, defend and save harmless Sonopress from and against any and all costs, claims, causes of action, suits, judgments, harm, damages, liabilities, losses and expenses (including, without limitation, all reasonable legal fees and disbursements) of any and every nature and kind whatsoever (whether arising out of a judgment or otherwise) ("Sonopress-Claims") actually incurred, sustained or suffered by Sonopress or by any of its Affiliates, successors, licensees and assigns and their respective officers, agents and employees ("Sonopress Parties") arising from, or otherwise attributable to (a) MGM's (or any of its affiliates') breach of, alleged breach of, or non-compliance with any of the provisions of this Agreement, or (b) the program content of any MGM product replicated under this Agreement, including, without limitation, the failure of MGM to possess all necessary rights (including without limitation, intellectual property rights, copyrights and trade marks), licenses, permissions, consents and authorizations so as to permit Sonopress to manufacture and otherwise render the Services in respect of the program content of any Unit to be replicated by Sonopress as contemplated by this Agreement. Without limiting the generality of the above provision, the indemnity obligations of MGM shall include, without limitation, the indemnification of Sonopress Parties from and against all Sonopress-Claims which arise out of or are in connection with any infringement by MGM of any patent, copyright, trademark, trade secret or other proprietary rights of any third parties solely in respect of the program content of any Unit in the course of Sonopress' Services to MGM hereunder, except where such Sonopress-Claim is a result of a breach of Sonopress of its

obligations hereunder. MGM will indemnify, defend and save harmless Sonopress Parties from any and all Sonopress-Claims which arise out of or are in connection with MGM's failure to pay any amount with respect to its licensors, artists, songwriters, authors or other right holders, or any portion thereof, no matter what the reason or excuse. For the avoidance of any doubt, MGM's obligation to indemnify the Sonopress Parties under this Paragraph 15 (b) shall in no way limit, impair or otherwise affect Sonopress' obligations under Paragraph 14 (b) or 15 (a).

(c) The person seeking indemnification (the "Indemnitee") shall promptly notify the other party (the "Indemnitor") in writing of any claim to which the foregoing indemnification applies and the Indemnitor shall undertake, at its own cost and expense, the defense thereof. The Indemnitee may, at its option and expense, engage its own counsel. The Indemnitee shall fully cooperate with the reasonable requests of the Indemnitor (at the Indemnitor's expense) in any compromise, settlement, litigation, or other resolution or disposition of such claim. If the Indemnitor fails to provide the Indemnitee with timely written notice confirming the Indemnitor's acceptance of the defense of the applicable claim and its engagement of competent and experienced counsel, the Indemnitee may engage its own counsel and the reasonable charges in connection therewith shall promptly be paid by the Indemnitor. If the Indemnitee settles or compromises any such suit, claim or proceeding, the amount thereof shall (in addition to any other indemnified costs incurred by the Indemnitee) be charged to the Indemnitor, provided that the Indemnitor's reasonable prior approval of such settlement or compromise has been secured.

(d) Without affecting or in any way limiting each party's indemnification obligations set forth in this Paragraph 15, each party agrees that, in the absence of fraud and/or any other intentional or willful misconduct by the other party, the other party's maximum liability for damages arising out of this Agreement for any Contract Year shall not exceed € 500,000.

16. Ownership of Units:

Any and all masters, packaging materials and other materials that are provided to Sonopress by or on behalf of MGM hereunder, as well as any and all Units and other materials that are produced and/or provided by Sonopress hereunder, shall be and remain the sole and exclusive property of MGM, and Sonopress shall not make any use thereof except in accordance with the terms and conditions of this Agreement. Without limiting the foregoing, MGM shall nonetheless be obligated to pay for all Units delivered to it by Sonopress in accordance with the terms of this Agreement. Sonopress shall hold all such materials in trust for MGM and must surrender them immediately upon demand therefor by MGM. Sonopress shall not cause or permit under any circumstances whatsoever, including but not limited to Sonopress's action or failure to perform an obligation under this Agreement, any lien or other encumbrance to attach to the property of MGM, and will not attach, sell, dispose of or in any way deal with such property in any way except as expressly provided in this Agreement.

17. Copyright:

(a) Sonopress will not use or permit the use of any masters, Units or any other materials hereunder in a manner which would violate any rights, including rights under copyright, of MGM or of the copyright holder in the content contained in such materials, and will not do anything to impair such rights or such copyright. Except as specifically directed by MGM, Sonopress will not in any way alter or edit any masters, Units, packaging materials or other materials including, but not limited to, deleting or permitting the deletion of any copyright notice or any titles or credits from any such materials.

(b) Sonopress acknowledges and agrees that it does not and will not acquire any rights to or under any good will, trademark, copyright or any other intangible or intellectual property right of MGM by reason of this Agreement or Sonopress's performance under this Agreement. MGM acknowledges and agrees that it does not and will not acquire any rights to or under any good will, trademark, copyright or any other intangible or intellectual property right of Sonopress by reason of this Agreement or Sonopress's or MGM's performance under this Agreement.

18. Assignment:

(a) Sonopress may not assign, transfer or sublicense in any case (other than to an Affiliate), any of its rights or obligations under this Agreement without the prior written consent of MGM, which consent shall not be unreasonably withheld. In the event of an approved assignment, this Agreement will be binding on such authorized assignee, transferee, sub-licensee or agent, but will not release Sonopress of any of its obligations under this Agreement. Sonopress will require each such assignee or transferee to assume this Agreement in full.

(b) MGM may assign, transfer or sublicense any of its rights or obligations under this Agreement upon prior written notice to Sonopress. This Agreement will be binding on such authorized assignee, transferee, sub-licensee or agent, but will not release MGM of any of its obligations under this Agreement. MGM will require each such assignee or transferee to assume this Agreement in full.

(c) In the event either party shall be acquired by a successor-in-interest, whether by way of merger, asset sale or otherwise, such successor-in-interest shall assume such party's rights and obligations under this Agreement in full.

19. Confidentiality:

Neither Sonopress nor MGM shall issue any press release or statement with regard to the terms and provisions of this Agreement without the consent of the other, nor shall either party disclose to any third party (other than its respective employees, directors, and officers, in their capacity as such, on a need-to-know basis), any information with respect to the terms and provisions or with respect to the materials delivered pursuant to the terms and provisions of this Agreement (including its very existence) except:

- (i) to the extent necessary to comply with the law or a valid court order of a court with competent jurisdiction, in which event the party making such disclosure shall so notify the other party as promptly as is practicable (if possible, prior to making such disclosure) and shall seek confidential treatment of such information;
- (ii) to the extent necessary to comply with the disclosure requirements of the S.E.C. or similar entities;
- (iii) to its parent, subsidiary or other affiliated companies or Affiliates, their banks, auditors and attorneys and similar professionals (collectively, its "Permitted Recipients"), provided that the disclosing party shall be liable to the other party in the event that any of its Permitted Recipients disclose any information that the disclosing party would be prohibited from disclosing pursuant to this paragraph;
- (iv) in order to enforce its rights pursuant to this Agreement; and
- (v) to a bona fide prospective or an actual buyer or financier as well as the Permitted Recipients thereof, provided that any such buyer or financier first executes a written confidentiality agreement pursuant to which they/it agree(s) to be bound by the provisions of this paragraph or a similar undertaking of confidentiality.

Notwithstanding anything to the contrary set forth herein, the obligations of confidentiality contained herein, as they relate to a transaction, shall not apply to the "tax structure" or "tax treatment" of a transaction (as these terms are used in Section 1.6011-4(b)(3) (or any successor provision) of the Treasury Regulations (the "Confidentiality Regulation") promulgated under Section 6011 of the Internal Revenue Code of 1986, as amended), and each party (and any related party of such party) may disclose to any and all persons, without limitation of any kind, the "tax structure" and "tax treatment" of a transaction (as these terms are defined in the Confidentiality Regulation). In addition, each party hereto acknowledges that it has no proprietary or exclusive rights to any tax matter or tax idea relating to a transaction.

20. Representations and Warranties:

Sonopress represents and warrants that it shall maintain throughout the Term adequate facilities and capacity for the full and timely performance, in a professional manner, of all of the Services contemplated hereunder. Sonopress shall not pledge or encumber any property of MGM's while in its possession, custody, or control, or permit the imposition of any liens, charges, encumbrances on such property. If, at any time during the Term, Sonopress shall determine that it is unable to provide any of the Services required in connection with a Workable Order hereunder, whether by itself or through an Approved Offload Facility pursuant to Paragraph 4(a) above, Sonopress shall promptly so notify MGM; thereupon, in addition to any and all of their rights MGM may have under this Agreement and otherwise, MGM shall have the right to engage any other party to provide the Services contemplated or to require Sonopress to engage another party approved by MGM to provide such Services, and all Units replicated by such other party pursuant to such Workable Order shall be counted towards MGM's fulfillment of the Guaranteed Quantity hereunder; provided, however, that in the event Sonopress's inability to provide Services is due to a Force Majeure Event (as defined in Paragraph 21 below), MGM's rights with respect to such inability shall be limited to those set forth in Paragraph 21 below. With respect to each and every Unit replicated on behalf of MGM, such Units shall be free of material defects in workmanship or signal quality, and shall be delivered in good and undamaged condition and shall, when delivered, be merchantable, complete, accurate, and fit and safe for the purposes for which the same are intended to be used, including without limitation, consumer use.

Sonopress represents and warrants that (a) it is a corporation validly existing and in good standing under the laws of the jurisdiction in which it is located, (b) it has the full right, power, legal capacity and authority to enter into this Agreement and to carry out the terms and conditions hereof, and (c) the consent of no other person or entity is necessary in order for it to enter into this Agreement and/or to perform the services required pursuant to this Agreement.

MGM represents and warrants that (a) it is a limited liability company validly existing and in good standing under the laws of the jurisdiction in which it is located, (b) it has the full right, power, legal capacity and authority to enter into this Agreement and to carry out the terms and conditions hereof, and (c) the consent of no other person or entity is necessary in order for it to enter into this Agreement and/or to perform the obligations required pursuant to this Agreement.

21. Force Majeure:

Each of the parties shall be excused from performing its obligations hereunder to the extent to which performance is prevented by strikes (unless caused by the willful action of such party), labor disturbances, any acts of God or nature, the elements, fires, floods, epidemics, acts of terrorism, acts of civil or military authority, war, riots, electrical failures or blackouts or other events which could not reasonably be foreseen (as of the date of this Agreement) and which are not reasonably within the control of such party, and specifically in the case of Sonopress, an industry-wide shortage of raw materials for the manufacture of DVDs hereunder which is beyond Sonopress's control despite its best efforts to mitigate (each such event, a "Force Majeure Event").

In the event of reliance of the preceding paragraph, the party affected will give immediate notice of the commencement of a Force Majeure Event as well as when such Force Majeure Event terminates. If Sonopress gives MGM notice of commencement of a Force Majeure Event, and is unable to fulfill MGM's Purchase Orders, MGM shall have the right during the period of the Force Majeure Event to have Sonopress's Services under this Agreement performed by other providers of Services, and all Units replicated by such other providers of Services during such period shall be counted towards MGM's fulfillment of the Guaranteed Quantity hereunder.

22. Miscellaneous :

- (a) Nothing contained herein shall be deemed to create a relationship of partnership, joint venture, agency, fiduciary or employment between the parties.

(b) This Agreement sets forth the entire understanding of the parties regarding the subject matter hereof and supersedes all prior oral or written agreement between them.

(c) No waiver of any default or breach of this Agreement by either party shall be deemed a continuing waiver or a waiver of any other breach or default, no matter how similar.

(d) Sonopress will execute, acknowledge and deliver any and all further documents that are necessary, expedient or proper to carry out and effectuate the purpose and intent of this Agreement.

(e) This Agreement shall be interpreted and construed and governed by the laws of the State of New York applicable to agreements entered into and wholly performed therein. Any legal proceeding arising out of or relating to this Agreement or its alleged breach shall be brought in the Federal District Court for the Southern District of New York, or in the event that such court lacks jurisdiction, in the Superior Court for the County of New York, to the exclusion of any other forum, and the parties hereby expressly agree and submit to the exclusive jurisdiction of the aforesaid courts. Each of the parties hereby irrevocably waives any and all rights to trial by jury in any proceedings arising out of or related to this Agreement.

(f) Sonopress shall maintain and keep at its principal office and/or at the offices of Bertelsmann AG in Gütersloh, Germany, accurate records and books of account and all other relevant records and documents (including without limitation all relevant contractual arrangements) relating to all aspects of its obligations and Services provided to MGM hereunder and under its arrangements with its respective other customers. At any time while the Agreement is in effect, and for a period of one (1) year after the later of (i) the expiration of the Term, including any renewals thereof; or (ii) the date on which Sonopress ceases providing Services to MGM, MGM may upon reasonable prior notice and during normal business hours, inspect Sonopress's applicable books of account with respect to all of Sonopress's obligations, covenants and agreements hereunder; provided that, Sonopress reserves the right to not make available, and to otherwise redact the specific portions of, any and all documents which do not relate to the scope of the audit or the Services provided by Sonopress to MGM. For the avoidance of any doubt, MGM shall use any findings or data generated as a result of such audit solely for purposes of monitoring Sonopress' compliance with the terms of this Agreement, and any such findings shall be kept strictly confidential by MGM in accordance with paragraph 19 hereof.

(g) Paragraph headings are inserted herein for convenience only and do not constitute a part of this Agreement.

(h) This Agreement may not be changed, modified, amended or supplemented, except in writing signed by all parties.

(i) If any term or provision of this Agreement shall be found to be void or contrary to law, such term or provision shall, but only to the extent necessary to bring this Agreement within the requirements of law, be deemed to be severable from the other terms and provisions of this Agreement, and the remainder of this Agreement shall be given effect as if the parties had not included the severed term herein.

(j) This Agreement shall have no force or effect, and nothing in this Agreement shall be binding upon MGM or Sonopress, unless and until such time, if any, as this Agreement has been executed by an authorized signature of MGM and Sonopress and has been delivered by MGM to Sonopress.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

SONOPRESS GMBH

By: H. Heemeyer
Name: Dr. Hermann Heemeyer
Title: Senior VP Sales & Marketing

MGM HOME ENTERTAINMENT LLC

By: Blake Thomas
Name: Blake Thomas
Title: Executive Vice President

EXHIBIT A

DESCRIPTION OF THE SERVICES AND PRICING

EXHIBIT A

1. Mastering

Input Media Specification

DLT (Digital Linear Tape), required in 10GB format, non compressed.
 Tape lay out according to DDP 2.0 (Disc Description Protocol).
 A separate DLT tape is required for each information layer and/or side.

Additional requirements for DVD 9:

The data (contents) and the referring DDP 2.0 protocol on the two production tapes together form a functional unit. The tapes must therefore be processed and labelled accordingly. The individual DLT tapes for layer 0 and 1 should be clearly labelled as such, as must be indicated whether the lay out of the data is made in Parallel (PTP) or Opposite (OTP) Track Path mode.

Copy protection

CSS encryption, process to be initiated and enabled during authoring process; no additional charge.

Promo discs

Promo discs will be sent to the individual territories based on a mailing list issued by MGM and will be invoiced on a quarterly basis to the territories, at € 2,00 per disc.

Glass Mastering / Electroplating & Check Discs up to 20 discs

Optical Mastering/Electroplating of information side includes:

- Optical Mastering of DLT tape,
- Electroplating process: production of galvanic family and moulding stampers, including ca. 1 year storage of stampers for re-runs

Format	price per master	waived at
DVD 5	€ 350.00	2,500+ discs per title per SKU
DVD 9	€ 650.00	2,500+ discs per title per SKU
DVD 10	€ 650.00	2,500+ discs per title per SKU
DVD 14	\$ 1,000.00	10,000 + discs per title per SKU
DVD 18	\$ 1,300.00	10,000 + discs per title per SKU

2. Disc Replication

- Replication of information side and label side
- Bonding of information side and label side
- Printing of 5 color label on disc

DVD Replication (units)	DVD 5	DVD 9	DVD 10	DVD 14	DVD 18
Price per disc	€ 0.505	€ 0.535	€ 0.520	\$ 1.07	\$ 1.19
Minimum initial order	1,000 units	1,000 units	1,000 units	5,000 units	5,000 units
Minimum repress order	500 units	500 units	500 units	5,000 units	5,000 units

White base counts as a color.

For labels with fewer than 5 colors (silk screen or Off-set), the disc price is reduced by €0,015 for each color below 5, with a maximum discount of € 0,045 Euro per disc (i.e. the disc price is reduced by €0,015 for labels with 4 colors, by €0,030 for labels with 3 colors, and by €0,045 for labels with 2 colors or only 1 color).

The pricing above includes any and all patent and other royalties in connection with the manufacturing of DVD Units, and MGM shall have no additional obligation whatsoever to pay any such royalties to any party.

In the event the patent royalties payable by Sonopress in connection with the manufacturing of each DVD Unit are increased or decreased during the Term, the pricing above shall be adjusted by the same increase or decrease on a per Unit basis.

In addition, to account for the delay between the time MGM pays for replication and the time Sonopress pays the patent royalties in connection with such replication, Sonopress will reserve a royalty payment discount of € 0,003 per replicated disc, which shall be, at MGM's option, either paid or credited to MGM every six months.

Volume rebate:

Beginning with the 10,000,001st Unit ordered by MGM during each Contract Year, the replication pricing shall be discounted by € 0,035 per Unit.

3. Box & additional assembly services

Softbox incl. assembly of 1 disc, 1 Booklet, 1 Outer Sleeve (Inlay) & cello-wrap	Price per assembled box
Single cases (for 1 disc)	
Single "Generic" with pushup hub grey w/o logo	€0.210
Single "Generic/Softbox" with pushup hub s.clear w/o logo	€0.220
Double cases (for 2 discs)	
Double Amaray grey w/o logo (Tray type 2)	€0.330
Double Amaray clear w/o logo	€0.340
Double Scanavo or Flexbox (black) w/o logo	€0.325
Additional Surcharges	
Cello-wrap	-.--
Extra insert, per insert (automatic)	€0.015
Extra disk insert (automatic)	€0.015
Stickers	
Automated sticker assembly, per sticker	€0.015
Manual sticker assembly, per sticker	€0.025
Manual sticker assembly, per sticker incl. adjusting to exact position	€0.030

For discs replicated for the U.K. and Benelux markets, application of local hologram stickers shall be FOC. MGM shall supply the local hologram stickers.

4. Print Production Colours in CMYK

quantity	outer sleeve 4/0 coloured	outer sleeve 4/4 coloured	Surcharge for Special Colour (Pantone)	Percentage share of orders in 2003
1,000 - 1,999	€ 0,053	€ 0,095	€ 0,025	10
2,000 - 2,999	€ 0,037	€ 0,067	€ 0,024	15
3,000 - 4,999	€ 0,033	€ 0,051	€ 0,023	15
5,000 - 9,999	€ 0,029	€ 0,044	€ 0,020	15
10,000 - 19,999	€ 0,021	€ 0,026	€ 0,014	15
20,000 - 59,999	€ 0,019	€ 0,026	€ 0,012	30
60,000 - 99,999	€ 0,017	€ 0,026	€ 0,012	-
100,000+	€ 0,017	€ 0,025	€ 0,011	-

Average Price	€ 0,029	€ 0,046	€ 0,018
---------------	---------	---------	---------

quantity	8 page booklet 4/1 coloured	8 page booklet 4/4 coloured	Surcharge for Special Colour (Pantone)	Percentage share of orders in 2003
1,000 - 1,999	€ 0,115	€ 0,183	€ 0,025	10
2,000 - 2,999	€ 0,088	€ 0,124	€ 0,024	15
3,000 - 4,999	€ 0,076	€ 0,107	€ 0,023	15
5,000 - 9,999	€ 0,070	€ 0,089	€ 0,020	15
10,000 - 19,999	€ 0,056	€ 0,071	€ 0,014	15
20,000 - 59,999	€ 0,046	€ 0,055	€ 0,012	30
60,000 - 99,999	€ 0,044	€ 0,051	€ 0,012	-
100,000+	€ 0,044	€ 0,051	€ 0,011	-

Average Price	€ 0,069	€ 0,093	€ 0,018
---------------	---------	---------	---------

quantity	4 page booklet 4/1 coloured	4 page booklet 4/4 coloured	Surcharge for Special Colour (Pantone)	Percentage share of orders in 2003
1,000 - 1,999	€ 0,063	€ 0,096	€ 0,025	10
2,000 - 2,999	€ 0,045	€ 0,067	€ 0,024	15
3,000 - 4,999	€ 0,038	€ 0,059	€ 0,023	15
5,000 - 9,999	€ 0,030	€ 0,053	€ 0,020	15
10,000 - 19,999	€ 0,023	€ 0,040	€ 0,014	15
20,000 - 59,999	€ 0,022	€ 0,035	€ 0,012	30
60,000 - 99,999	€ 0,021	€ 0,031	€ 0,012	-
100,000+	€ 0,021	€ 0,031	€ 0,011	-

Average Price	€ 0,033	€ 0,053	€ 0,018
---------------	---------	---------	---------

quantity	2 page booklet 4/1 coloured	2 page booklet 4/4 coloured	Surcharge for Special Colour (Pantone)	Percentage share of orders in 2003
1,000 - 1,999	€ 0,051	€ 0,085	€ 0,025	10
2,000 - 2,999	€ 0,035	€ 0,056	€ 0,024	15
3,000 - 4,999	€ 0,031	€ 0,046	€ 0,023	15
5,000 - 9,999	€ 0,029	€ 0,035	€ 0,020	15
10,000 - 19,999	€ 0,024	€ 0,031	€ 0,014	15
20,000 - 59,999	€ 0,020	€ 0,027	€ 0,012	30
60,000 - 99,999	€ 0,016	€ 0,021	€ 0,012	-
100,000+	€ 0,016	€ 0,019	€ 0,011	-

Average Price	€ 0,029	€ 0,042	€ 0,018
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5. Compression and Authoring

In the event MGM wishes Sonopress to provide compression and authoring services, MGM and Sonopress shall mutually agree on the charges for each title pursuant to the basis for such calculation set forth in Exhibit C hereto.

6. Lead Time (print is in stock)

Mastering and check disc package

4 working days after receipt and approval of DLT(s)

Replication/packaging & re-order lead time

For orders ≤ 200.000 discs: 5 working days after approval of check disc

For orders ≤ 500.000 discs: 6 working days after approval of check disc

For orders ≤ 1.000.000 discs: 8 working days after approval of check disc

For orders above 1.000.000 discs: To be discussed

Transportation time between Sonopress plants and MGM hubs are not included in the lead time.

7. Terms & Conditions

Payment:

net, within 45 days

Payments overdue will bear interest of 0,5% per month

Storage:

Sonopress is willing and able to store print components up to 6 months FOC. After which Sonopress is entitled to charge € 4,00 per 1.000 print components per quarter.

Shipping Costs:

Shipping costs in Europe, North America, Singapore, Hongkong, China:

FOC for orders exceeding 3,000 units; at cost / pass through for orders under 3,000 units

Shipping costs to Japan:

At cost / pass through + 10% handling

Arvato Gütersloh deliveries FOC

All prices are in € (Euro) or \$ (US Dollar) and exclude all taxes, custom duties, tariffs, content license fees and the like.

8. Market Index for Polycarbonates as of January 1, 2005

€ 3,55

Price Development PC GP Moulding Contract
Price ICIS in Euro

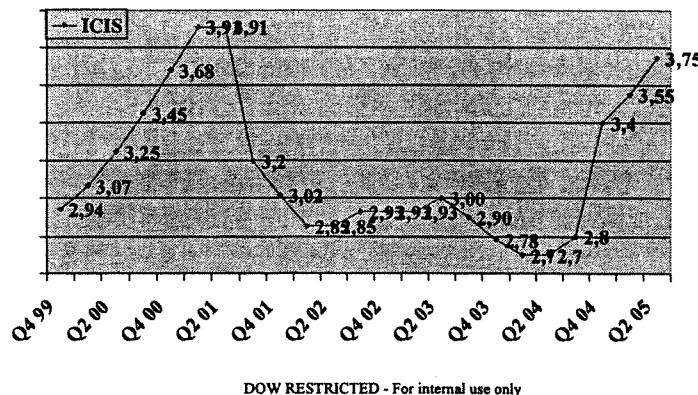


EXHIBIT B

DVD PRODUCT SPECIFICATIONS

ECMA

Standardizing Information and Communication Systems

120 mm DVD - Read-Only Disk

ECMA

Standardizing Information and Communication Systems

120 mm DVD - Read-Only Disk

Brief History

ECMA Technical Committee TC31 was established in 1984 for the standardization of Optical Disks and Optical Disk Cartridges (ODC). Since its establishment, the Committee has made major contributions to ISO/IEC SC23 toward the development of International Standards for 90 mm, 120 mm, 130 mm, 300 mm, and 356 mm media. Numerous standards have been developed by TC31 and published by ECMA, almost all of which have also been adopted by ISO/IEC under the fast-track procedure as International Standards.

In February 1997 a group of ten Companies, known as the DVD Consortium, proposed to TC31 to develop an ECMA Standard for the first member of a family of 120 mm optical disks. TC31 adopted this project and started work on a first ECMA Standard for DVD - Read-Only disks. This ECMA Standard specifies the physical characteristics of such a disks which can be used for video, audio or data applications. A standard for volume and file structure common to these three types of application has been developed in ECMA Technical Committee TC15. Further work has been undertaken for a rewritable disk known as DVD-RAM, for a case for such disks, and for a writable disk DVD-R. This work is supported by nine members of the DVD Forum.

This Standard ECMA-267 specifies four Types of DVD - Read-Only disks with a nominal capacity from 4,7 Gbytes to 17,0 Gbytes. Standard ECMA-268 specifies a 80 mm DVD - Read-Only disk which differs from that of Standard ECMA-267 only where the relevant parameters depend on the dimension of the diameter. Four Types of such DVD disks with a nominal capacity of 1,46 Gbytes to 5,32 Gbytes are specified. It has been adopted by ISO/IEC JTC 1 as International Standard ISO/IEC 16448.

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Section 1 - General

1 Scope

This ECMA Standard specifies the mechanical, physical and optical characteristics of a 120 mm, read-only optical disk to enable the interchange of such disks. It specifies the quality of the recorded signals, the format of the data and the recording method, thereby allowing for information interchange by means of such disks. This disk is identified as DVD - Read-Only Disk.

This ECMA Standard specifies

- four related but different Types of this disk (see clause 7),
- the conditions for conformance,
- the environments in which the disk is to be operated and stored,
- the mechanical and physical characteristics of the disk, so as to provide mechanical interchange between data processing systems,
- the format of the information on the disk, including the physical disposition of the tracks and sectors, the error correcting codes and the coding method used,
- the characteristics of the signals recorded on the disk, enabling data processing systems to read the data from the disk.

This ECMA Standard provides for interchange of disks between disk drives. Together with a standard for volume and file structure, it provides for full data interchange between data processing systems.

2 Conformance

2.1 Optical Disk

A claim of conformance shall specify the Type of the disk. An optical disk shall be in conformance with this ECMA Standard if it meets the mandatory requirements specified for its Type.

2.2 Generating system

A generating system shall be in conformance with this ECMA Standard if the optical disk it generates is in accordance with 2.1.

2.3 Receiving system

A receiving system shall be in conformance with this ECMA Standard if it is able to handle all four Types of optical disk according to 2.1.

3 Reference

ECMA-287 (1999) Safety of electronic equipment

4 Definitions

For the purpose of this ECMA Standard the following definitions apply.

4.1 Adhesive layer

A layer of adhesive material bonding together the two parts of the disk.

4.2 Channel bit

The elements by which, after modulation, the binary values ZERO and ONE are represented on the disk by pits.

4.3 Clamping Zone

The annular part of the disk within which a clamping force is applied by a clamping device.

4.4 Digital Sum Value (DSV)

The arithmetic sum obtained from a bit stream by allocating the decimal value 1 to bits set to ONE and the decimal value -1 to bits set to ZERO.

4.5 Disk Reference Plane

A plane defined by the perfectly flat annular surface of an ideal spindle onto which the Clamping Zone of the disk is clamped, and which is normal to the axis of rotation.

4.6 Dual Layer disk

A optical disk with one or two entrance surface(s), in which each entrance surface gives access to a different pair of recorded layers.

4.7 Dummy substrate

A layer which may be transparent or not, provided for the mechanical support of the disk and/or of a recorded layer.

4.8 Entrance surface

The surface of the disk onto which the optical beam first impinges.

4.9 Optical disk

A disk that accepts and retains information in the form of pits in a recorded layer that can be read by an optical beam.

4.10 Physical sector number

A serial number allocated to physical sectors on the disk.

4.11 Read-only disk

An optical disk in which the information has been recorded when manufacturing the disk. The information cannot be modified and can only be read from the disk.

4.12 Recorded layer

A layer of the disk on, or in, which data is recorded.

4.13 Reed-Solomon code

An error detection and/or correction code for the correction of errors.

4.14 Reserved field

A field set to all ZEROS unless otherwise stated, and reserved for future standardization.

4.15 Sector

The smallest part of a track in the Information Zone that can be accessed independently of other addressable parts.

4.16 Single Layer disk

An optical disk with one or two entrance surface(s), in which each entrance surface gives access to a different recorded layer.

4.17 Spacer

In the case of Dual Layer disks, the transparent layer placed between the two recorded layers accessible through the same entrance surface.

4.18 Substrate

A transparent layer of the disk, provided for mechanical support of the recorded layer(s), through which the optical beam can access the recorded layer(s).

4.19 Track

A 360° turn of a continuous spiral.

4.20 Track pitch

The distance between the centrelines of a pair of adjacent physical tracks, measured in radial direction.

4.21 Zone

An annular area of the disk.

5 Conventions and notations**5.1 Representation of numbers**

A measured value is rounded off to the least significant digit of the corresponding specified value. For instance, it implies that a specified value of 1,26 with a positive tolerance of + 0,01 and a negative tolerance of - 0,02 allows a range of measured values from 1,235 to 1,275.

Numbers in decimal notations are represented by the digits 0 to 9.

Numbers in hexadecimal notation are represented by the hexadecimal digits 0 to 9 and A to F in parentheses.

The setting of bits is denoted by ZERO and ONE.

Numbers in binary notations and bit patterns are represented by strings of digits 0 and 1, with the most significant bit shown to the left.

Negative values of numbers in binary notation are given as Two's complement.

In each field the data is recorded so that the most significant byte (MSB), identified as Byte 0, is recorded first and the least significant byte (LSB) last.

In a field of $8n$ bits, bit $b_{(8n-1)}$ shall be the most significant bit (msb) and bit b_0 the least significant bit (lsb). Bit $b_{(8n-1)}$ is recorded first.

5.2 Names

The names of entities, e.g. specific tracks, fields, zones, etc. are given a capital initial.

6 List of acronyms

BCA	Burst-Cutting Area
BP	Byte Position
BPF	Band Pass Filter
CLV	Constant Linear Velocity
CPR_MAI	Copyright Management Information
DCC	DC Component (suppress control)
DL	Dual Layer
DPD	Differential Phase Detection
DSV	Digital Sum Value
ECC	Error Correction Code
EDC	Error Detection Code
EQ	Equalizer
FWHM	Full Width at Half Maximum
HF	High Frequency
ID	Identification Data
IED	ID Error Detection (code)
IR	Index of Refraction
LPF	Low-Pass Filter
LSB	Least Significant Byte
MSB	Most Significant Byte

NRZ	Non Return to Zero
NRZI	Non Return to Zero Inverted
OTP	Opposite Track Path
PBS	Polarizing Beam Splitter
PE	Phase Encoding
PI	Parity (of the) Inner (code)
PLL	Phase-Locked Loop
PO	Parity (of the) Outer (code)
PTP	Parallel Track Path
PUH	Pick-Up Head
RIN	Relative Intensity Noise
RS	Reed-Solomon (code)
RZ	Return to Zero
SL	Single Layer
SYNC Code	Synchronisation Code
lsb	least significant bit
msb	most significant bit

7 General description of the disk

The optical disk that is the subject of this ECMA Standard consists of two substrates bonded together by an adhesive layer, so that the recorded layers are on the inside (See annex N). The centring of the disk is performed on the edge of the centre hole of the assembled disk on the side currently read. Clamping is performed in the Clamping Zone. This ECMA Standard specifies the following Types.

- Type A** consists of a substrate, a single recorded layer and a dummy substrate. The recorded layer can be accessed from one side only. The nominal capacity is 4,7 Gbytes.
- Type B** consist of two substrates, and two recorded layers. From one side of the disk, only one of these recorded layers can be accessed. The nominal capacity is 9,4 Gbytes.
- Type C** consists of a substrate, a dummy substrate and two recorded layers with a spacer between them. Both recorded layers can be accessed from one side only. The nominal capacity is 8,5 Gbytes.
- Type D** consists of two substrates, each having two recorded layers with a spacer between these two recorded layers. From one side of the disk, only one pair of recorded layers can be accessed. The nominal capacity is 17,0 Gbytes.

Figure 1 shows schematically these four Types. Types A and B are Single Layer (SL) disks and Types C and D are Dual Layer (DL) disks. The two layers of DL disks are identified as Layer 0 and Layer 1. Layer 0 is the layer nearer to the entrance surface. Types A and C are 1-sided disks, Types B and D are 2-sided disks.

In Type C the function of the adhesive layer can be provided by the spacer between the two recorded layers where Layer 1 is placed, for instance embossed, on the dummy substrate.

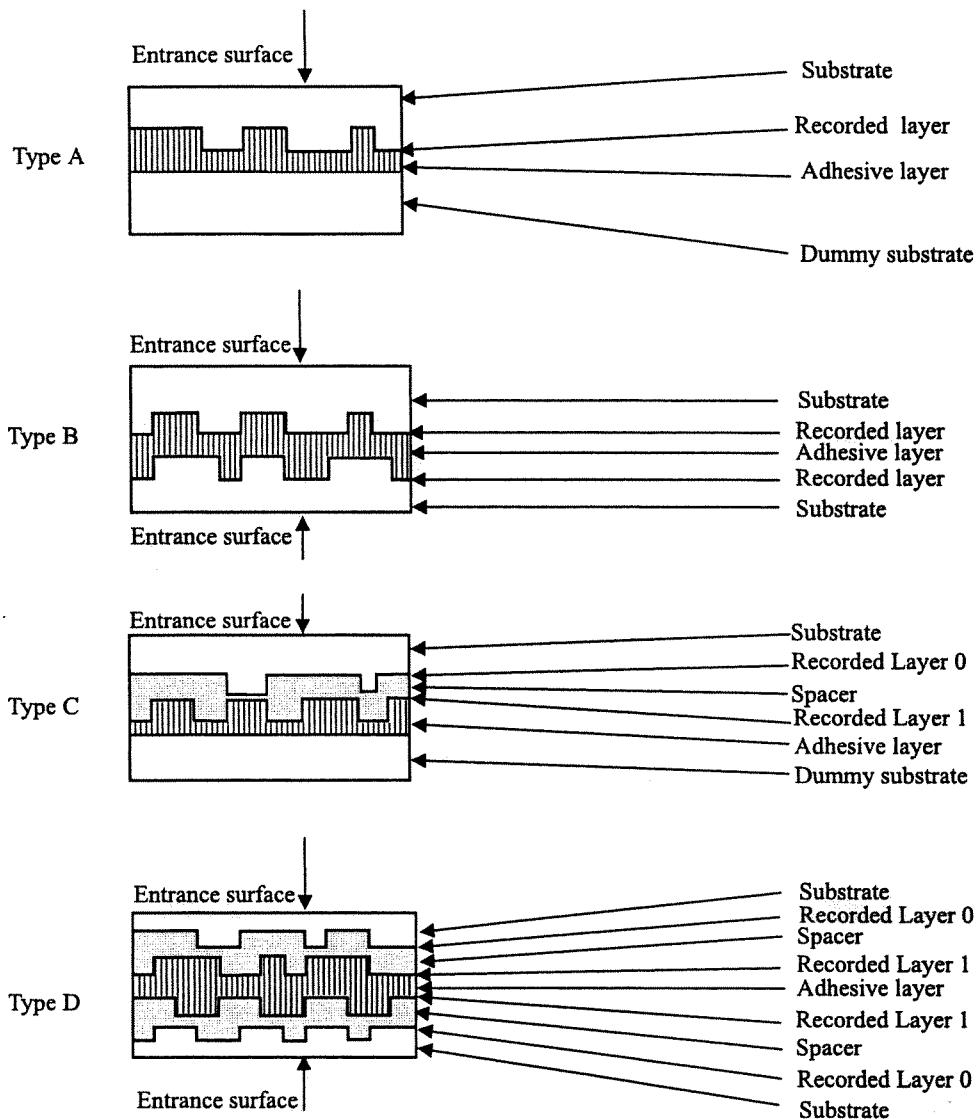


Figure 1 - Types of 120 mm DVD - Read-Only disks

8 General requirements

8.1 Environments

8.1.1 Test environment

The test environment is the environment where the air immediately surrounding the disk has the following properties.

a) For dimensional measurements

temperature	: $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$
relative humidity	: 45 % to 55 %
atmospheric pressure	: 86 kPa to 106 kPa

b) For other measurements

temperature	: 15°C to 35°C
relative humidity	: 45 % to 75 %
atmospheric pressure	: 86 kPa to 106 kPa

Unless otherwise stated, all tests and measurements shall be made in this test environment.

8.1.2 Operating environment

This ECMA Standard requires that an optical disk which meets all mandatory requirements of this ECMA Standard in the specified test environment provides data interchange over the specified ranges of environmental parameters in the operating environment.

Disk used for data interchange shall be operated under the following conditions, when mounted in the drive supplied with voltage and measured on the outside surface of the disk.

The disk exposed to storage conditions shall be conditioned in the operating environment for at least two hours before operating.

temperature	: -25 °C to 70 °C
relative humidity	: 3 % to 95 %
absolute humidity	: 0,5 g/m ³ to 60 g/m ³
sudden change of temperature	: 50 °C max.
sudden change of relative humidity	: 30 % max.

There shall be no condensation of moisture on the disk.

8.1.3 Storage environment

The storage environment is the environment where the air immediately surrounding the optical disk shall have the following properties.

temperature	: -20 °C to 50 °C
relative humidity	: 5 % to 90 %
absolute humidity	: 1 g/m ³ to 30 g/m ³
atmospheric pressure	: 75 kPa to 106 kPa
temperature variation	: 15 °C /h max.
relative humidity variation	: 10 %/h max.

8.1.4 Transportation

This ECMA Standard does not specify requirements for transportation; guidance is given in annex P.

8.2 Safety requirements

The disk shall satisfy the requirements of Standard ECMA-287, when used in the intended manner or in any foreseeable use in an information system.

8.3 Flammability

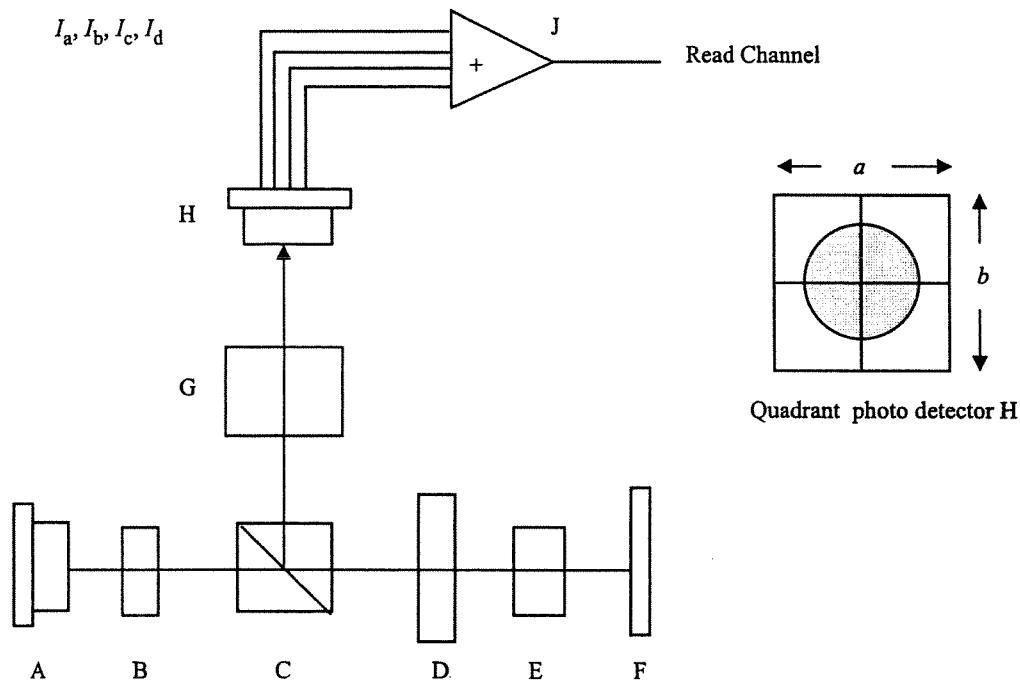
The disk shall be made from materials that comply with the flammability class for HB materials, or better, as specified in Standard ECMA-287.

9 Reference measurement devices

The reference measurement devices shall be used for the measurements of optical parameters for conformance with this ECMA Standard. The critical components of these devices have specific properties defined in this clause.

9.1 Pick Up Head (PUH)

The optical system for measuring the optical parameters is shown in figure 2. It shall be such that the detected light reflected from the entrance surface of the disk is minimized so as not influencing the accuracy of measurement. The combination of the polarizing beam splitter C with the quarter-wave plate D separates the incident optical beam and the beam reflected by the optical disk F. The beam splitter C shall have a p-s intensity/reflectance ratio of at least 100. Optics G generates an astigmatic difference and collimates the light reflected by the recorded layer of the optical disk F for astigmatic focusing and read-out. The position of the quadrant photo detector H shall be adjusted so that the light spot becomes a circle the centre of which coincides with the centre of the quadrant photo detector H when the objective lens is focused on the recorded layer. An example of such a photo detector H is shown in figure 2. The dimensions a and b equal M times 10 μm to 12 μm , where M is the transversal magnification factor from the disk to its conjugate plane near the quadrant photo detector H.



97-0019-A	
A	Laser diode
B	Collimator lens
C	Polarizing beam splitter
D	Quarter-wave plate
E	Objective lens
F	Optical disk
G	Optics for the astigmatic focusing method
H	Quadrant photo detector
I_a, I_b, I_c, I_d	Output from the quadrant photo detector
J	d.c. coupled amplifier

Figure 2 - Optical system for PUH

The characteristics of the PUH shall be as follows.

Wavelength (λ)	$650 \text{ nm} \pm 5 \text{ nm}$
Polarization	circularly polarized light
Polarizing beam splitter	shall be used unless otherwise stated
Numerical aperture	$0,60 \pm 0,01$
Light intensity at the rim of the pupil of the objective lens	60 % to 70 % of the maximum intensity level in radial direction, and over 90 % of the maximum intensity level in tangential direction
Wave front aberration after passing through an ideal substrate of the single layer disk (Thickness : 0,6 mm and index of refraction : 1,56)	$0,033 \lambda \text{ rms max.}$
Normalized detector size on a disk	$100 \mu\text{m}^2 < S / M^2 < 144 \mu\text{m}^2$ where S is the total surface of the photo detector of the PUH

Relative intensity noise (RIN) - 134 dB/Hz max.
 $10 \log [(a.c. \text{ light power density } / \text{Hz}) / \text{d.c. light power}]$

9.2 Measurement conditions

The measuring conditions for operational signals shall be as follows.

Scanning velocity at a Channel bit rate
 of 26,15625 Mbits/s

for Single Layer disks: $3,49 \text{ m/s} \pm 0,03 \text{ m/s}$
 for Dual Layer disks: $3,84 \text{ m/s} \pm 0,03 \text{ m/s}$

Clamping force

$2,0 \text{ N} \pm 0,5 \text{ N}$

Taper cone angle

$40,0^\circ \pm 0,5^\circ$, see annex E

CLV servo characteristic

f (-3 dB), closed loop bandwidth : 5 Hz

Focusing method

astigmatic method

Tracking method

differential phase detection

9.3 Normalized servo transfer function

In order to specify the servo system for axial and radial tracking, a function H_s is used (equation I). It specifies the nominal values of the open-loop transfer function H of the Reference Servo(s) in the frequency range 23,1 Hz to 10 kHz.

$$H_s(i\omega) = \frac{1}{3} \times \left(\frac{\omega_0}{i\omega} \right)^2 \times \frac{1 + \frac{3i\omega}{\omega_0}}{1 + \frac{i\omega}{3\omega_0}} \quad (I)$$

where

$$\omega = 2\pi f$$

$$\omega_0 = 2\pi f_0$$

$$i = \sqrt{-1}$$

f_0 is the 0 dB crossover frequency of the open loop transfer function. The crossover frequencies of the lead-lag network of the servo are given by

$$\begin{array}{ll} \text{lead break frequency:} & f_1 = f_0 \times 1/3 \\ \text{lag break frequency} & f_2 = f_0 \times 3 \end{array}$$

9.4 Reference Servo for axial tracking

For an open loop transfer function H of the Reference Servo for axial tracking, $|1+H|$ is limited as schematically shown by the shaded surface of figure 3.

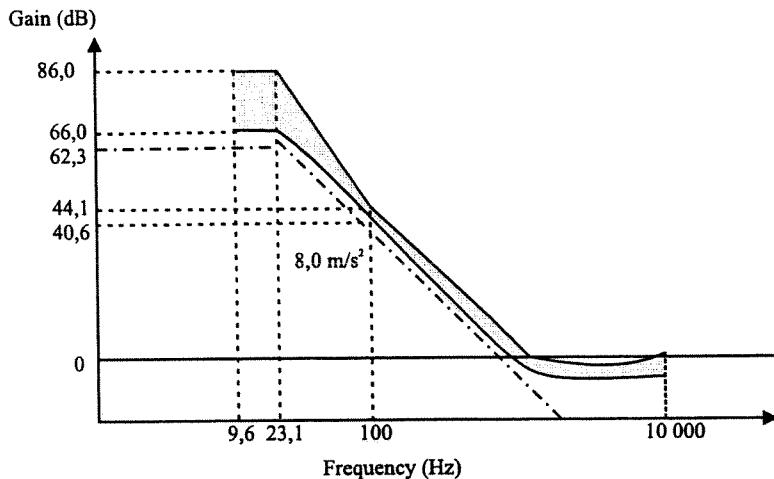


Figure 3 - Reference Servo for axial tracking

Bandwidth 100 Hz to 10 kHz

$|1 + H|$ shall be within 20 % of $|1 + H_s|$.

The crossover frequency $f_0 = \omega_0 / 2\pi$ shall be specified by equation (II), where α_{\max} shall be 1,5 times larger than the expected maximum axial acceleration of 8 m/s^2 . The tracking error e_{\max} shall not exceed $0,23 \mu\text{m}$. Thus the crossover frequency f_0 shall be

$$f_0 = \frac{1}{2\pi} \sqrt{\frac{3 \alpha_{\max}}{e_{\max}}} = \frac{1}{2\pi} \sqrt{\frac{8 \times 1,5 \times 3}{0,23 \times 10^{-6}}} = 2,0 \text{ kHz} \quad (\text{II})$$

The axial tracking error e_{\max} is the peak deviation measured axially above or below the 0 level.

Bandwidth 23,1 Hz to 100 Hz

$|1 + H|$ shall be within the limits defined by the following four points.

40,6 dB at 100 Hz	($ 1 + H_s $ - 20% at 100 Hz)
66,0 dB at 23,1 Hz	($ 1 + H_s $ - 20% at 23,1 Hz)
86,0 dB at 23,1 Hz	($ 1 + H_s $ - 20% at 23,1 Hz add 20 dB)
44,1 dB at 100 Hz	($ 1 + H_s $ + 20% at 100 Hz)

Bandwidth 9,6 Hz to 23,1 Hz

$|1 + H|$ shall be between 66,0 dB and 86,0 dB.

9.5 Reference Servo for radial tracking

For an open-loop transfer function H of the Reference Servo for radial tracking, $|1+H|$ is limited as schematically shown by the shaded surface of figure 4.

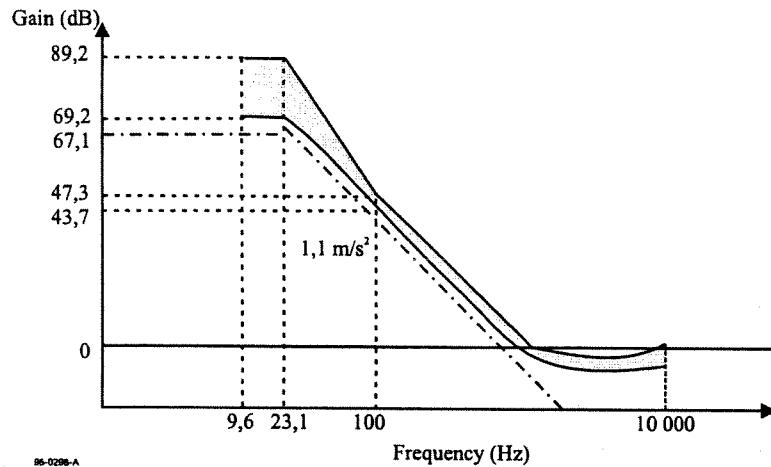


Figure 4 - Reference Servo for Radial Tracking

Bandwidth from 100 Hz to 10 kHz

$|1 + H|$ shall be within 20 % of $|1 + H_s|$.

The crossover frequency $f_0 = \omega_0 / 2\pi$ shall be specified by equation (III), where α_{\max} shall be 1,5 times larger than the expected maximum radial acceleration of $1,1 \text{ m/s}^2$. The tracking error e_{\max} shall not exceed $0,022 \mu\text{m}$. Thus the crossover frequency f_0 shall be

$$f_0 = \frac{1}{2\pi} \sqrt{\frac{3 \alpha_{\max}}{e_{\max}}} = \frac{1}{2\pi} \sqrt{\frac{1,1 \times 1,5 \times 3}{0,022 \times 10^{-6}}} = 2,4 \text{ kHz} \quad (\text{III})$$

The radial tracking error is the peak deviation measured radially inwards or outwards the 0 level.

Bandwidth from 23,1 Hz to 100 Hz

$|1 + H|$ shall be within the limits defined by the following four points.

43,7 dB at 100 Hz	($ 1 + H_s $ - 20% at 100 Hz)
69,2 dB at 23,1 Hz	($ 1 + H_s $ - 20% at 23,1 Hz)
89,2 dB at 23,1 Hz	($ 1 + H_s $ - 20% at 23,1 Hz add 20 dB)
47,3 dB at 100 Hz	($ 1 + H_s $ + 20% at 100 Hz)

Bandwidth from 9,6 Hz to 23,1 Hz

$|1 + H|$ shall be between 69,2 dB and 89,2 dB.

Section 2 - Dimensional, mechanical and physical characteristics of the disk**10 Dimensional characteristics (figures 5 to 8)**

Dimensional characteristics are specified for those parameters deemed mandatory for interchange and compatible use of the disk. Where there is freedom of design, only the functional characteristics of the elements described are indicated. The enclosed drawings show the dimensional requirements in summarized form. The different parts of the disk are described from the centre hole to the outside rim.

The dimensions are referred to two Reference Planes P and Q.

Reference Plane P is the primary Reference Plane. It is the plane on which the bottom surface of the Clamping Zone (see 10.4) rests.

Reference Plane Q is the plane parallel to Reference Plane P at the height of the top surface of the Clamping Zone.

10.1 Overall dimensions

The disk shall have an overall diameter

$$d_1 = 120,00 \text{ mm} \pm 0,30 \text{ mm}$$

The centre hole of a substrate or a dummy substrate shall have a diameter

$$+ 0,15 \text{ mm}$$

$$d_2 = 15,00 \text{ mm}$$

$$- 0,00 \text{ mm}$$

The diameter of the hole of an assembled disk, i.e. with both parts bonded together, shall be 15,00 mm min., see figure 6.

There shall be no burr on both edges of the centre hole.

The edge of the centre hole shall be rounded off or chamfered. The rounding radius shall be 0,1 mm max. The chamfer shall extend over a height of 0,1 mm max.

The thickness of the disk, including adhesive layer, spacer(s) and label(s), shall be

$$+ 0,30 \text{ mm}$$

$$e_1 = 1,20 \text{ mm}$$

$$- 0,06 \text{ mm}$$

10.2 First transition area

In the area defined by d_2 and

$$d_3 = 16,0 \text{ mm min.}$$

the surface of the disk is permitted to be above Reference Plane P and/or below Reference Plane Q by 0,10 mm max.

10.3 Second transition area

This area shall extend between diameter d_3 and diameter

$$d_4 = 22,0 \text{ mm max.}$$

In this area the disk may have an uneven surface or burrs up to 0,05 mm max. beyond Reference Planes P and/or Q.

10.4 Clamping Zone

This zone shall extend between diameter d_4 and diameter

$$d_5 = 33,0 \text{ mm min.}$$

Each side of the Clamping Zone shall be flat within 0,1 mm. The top side of the Clamping Zone, i.e. that of Reference Plane Q shall be parallel to the bottom side, i.e. that of Reference Plane P within 0,1 mm.

In the Clamping Zone the thickness e_2 of the disk shall be

$$+ 0,20 \text{ mm}$$

$$e_2 = 1,20 \text{ mm}$$

$$- 0,10 \text{ mm}$$

10.5 Third transition area

This area shall extend between diameter d_5 and diameter

$$d_6 = 44,0 \text{ mm max.}$$

In this area the top surface is permitted to be above Reference Plane Q by

$$h_1 = 0,25 \text{ mm max.}$$

or below Reference Plane Q by

$$h_2 = 0,10 \text{ mm max.}$$

The bottom surface is permitted to be above Reference Plane P by

$$h_3 = 0,10 \text{ mm max}$$